

NOVEMBER/DECEMBER 2019

**MPH32 — NUCLEAR AND PARTICLE
PHYSICS**

Time : Three hours

Maximum : 75 marks

SECTION A — ($5 \times 6 = 30$ marks)

Answer ALL questions.

- (a) Give the theory low energy P - P scattering.

Or

- (b) Discuss the concept of isospin formalism.

2. (a) Explain the various conservation laws in nuclear reactions.

Or

- (b) What do you mean by nuclear reaction cross section? A 0.01 mm thick ${}_3\text{Li}^7$ target is bombarded with 10^{13} particles per second. As a result, 10^8 neutrons per second produced. What would be the cross section for this reaction? The density of ${}_3\text{Li}^7 = 500 \text{ kg/m}^3$.



3. (a) Describe the liquid drop model of nucleus.

Or

- (b) What are magic numbers? Explain how the shell model of nucleus accounts for the existence of magic numbers?

4. (a) Explain the shape of beta ray spectrum.

Or

- (b) What is the evidence for existence of neutrino? Explain the violation of parity conservation in beta decay.

5. (a) Briefly explain the classification elementary particles.

Or

- (b) What are quarks? Give quantum number associated with each quark.

SECTION B — ($3 \times 15 = 45$ marks)

Answer any THREE questions.

6. Give the simple theory of deuteron. Obtain and plot the wave function for the deuteron ground state taken as an S-state.
7. Give an account of Bohr's compound nucleus formation hypothesis for nuclear reaction.

8. Discuss the main features of collective model for atomic nucleus. Discuss the vibration and rotational states of the nucleus.

9. Discuss internal conversion in gamma rays. What are the selection rules for gamma transitions between two nuclear states?

10. Discuss SU(2) and SU(3) multiplets. Write a note on Gell Mann-Okuba mass formula.

